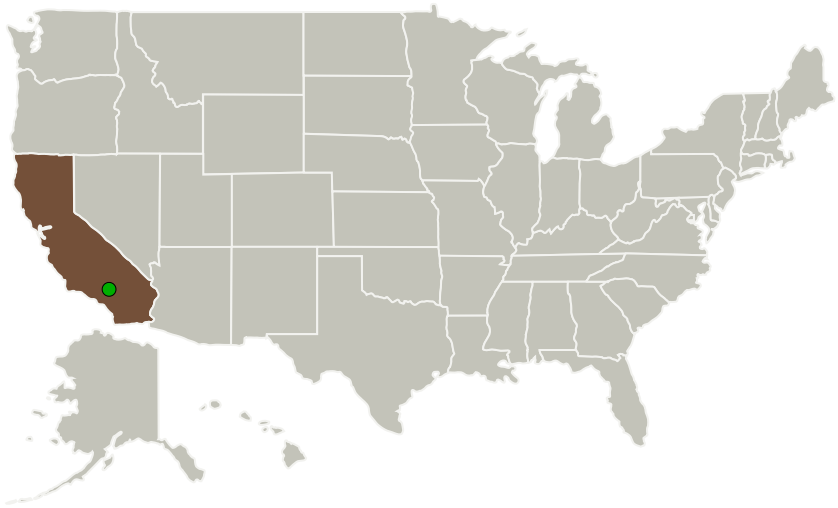
Real-Time Methods for Adaptive Suppression of Adverse Aeroservoelastic Dynamics, Phase II

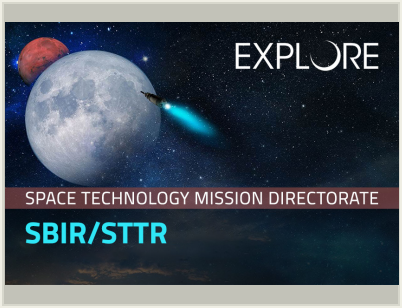
Completed Technology Project (2011 - 2016)

Project Introduction

Adverse aeroservoelastic interaction is a problem on aircraft of all types causing repeated loading, enhanced fatigue, undesirable oscillations and catastrophic flutter. Traditionally, to suppress adverse aeroservoelastic interaction, notch and/or roll off filters are used in the primary flight control system architecture. This solution has pitfalls; rigid body performance is degraded due to resulting phase penalty and it is not robust to off nominal behavior. In Phase I, an approach was developed that is entitled, Modal Isolation and Damping for Adaptive Aeroservoelastic Suppression (MIDAAS). This adaptive technique determines an optimal blend of multiple outputs that effectively isolates a problematic lightly damped mode and simultaneously determines an optimal blend of multiple inputs to suppress the problematic mode via feedback. Adverse effects on aircraft rigid body performance are minimized, resulting in virtually no phase penalty. MIDAAS was validated against aeroservoelastic F/A-18C aircraft models with varying stores configurations and demonstrated very successful performance. In the proposed Phase II program, a robust real-time adaptive aeroservoelastic suppression solution will be developed with a buildup approach that includes further MIDAAS enhancements, extensive validation studies utilizing a high-fidelity CFD-based aeroelastic model of the NASA X-53 aircraft, and extensive validation studies utilizing real-time pilot in the loop simulation capability.

Primary U.S. Work Locations and Key Partners





Real-Time Methods for Adaptive Suppression of Adverse Aeroservoelastic Dynamics, Phase II

Table of Contents

Real-Time Methods for Adaptive Suppression of Adverse Aeroservoelastic Dynamics, Phase II

Completed Technology Project (2011 - 2016)

Organizations Performing Work	Role	Type	Location
Systems Technology, Inc	Lead Organization	Industry	
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Systems Technology, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Brian P Danowsky

Co-Investigator:

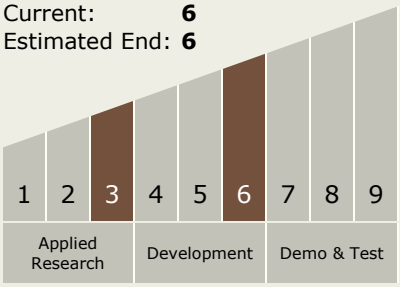
Brian Danowsky

Real-Time Methods for Adaptive Suppression of Adverse Aeroservoelastic Dynamics, Phase II

Completed Technology Project (2011 - 2016)

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System